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RESULTS OF TOMATO VARIETY TESTS IN THE GREAT PLAINS REGION

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DESIRABLE CHARACTERISTICS

For several years extensive trials of tomato varieties have been conducted at the Cheyenne Horticultural Field Station, Cheyenne, Wyo. Approximately 400 varieties and strains were grown and observed. Because of the large number of varieties involved, not all of these could be grown in any one year, but certain well-known varieties, such as Earliana, Bonny Best, Marglobe, and Bison, have been grown each year to serve as standards by which the performance of other varieties might be judged. Many of these varieties have also been grown and observed by cooperators located in various parts of the central Great Plains that represent fairly well the range of climatic conditions existing in the region served by this station.

So great are the variations in climatic conditions prevailing in this region that no single variety can be expected to do equally well in all sections. Altitudes range from 2,500 to over 7,000 feet in the various agricultural sections. In the higher, cooler altitudes commercial tomato production is not feasible, and the needs of the home gardener are considered of primary importance. For the home gardener in such locations a tomato variety must be early, and if necessary, fruit size or yield may be sacrificed for earliness. In the course of these trials several varieties have been found that should be of value to home gardeners, in that they ripen a relatively large number of fruits of high quality which are of suitable size for home use though somewhat smaller than usually considered desirable for market purposes.

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In the lower, warmer sections of this region the selection of a suitable variety is a different problem. For the market gardener earliness is probably just as important there as in the higher, cooler sections, but a variety must also be prolific and produce fruits of at least medium size if profitable yields are to be realized. For canning purposes a variety need not be of the extra early type, but yield and fruit size are as important as they are for market gardening. Moreover, for whatever purpose it is grown, a variety for such locations must be able to set its fruit under the relatively hot, dry atmospheric conditions that so frequently exist in these sections during July and August. One of the most common and most serious faults of the varieties being grown at the present time is their inability to set fruits during the early part of the growing season. As a consequence, they do not start production until late in the season and yield only a fraction of the crop that the grower expects.

The task of finding varieties to meet these latter requirements has proved to be more difficult than that of finding better sorts for home gardeners living in those sections having short growing seasons. For this reason, the list of varieties discussed in this circular, with the possible exception of Danmark, offers but little assistance to the commercial grower in the way of new varieties that are better suited to his needs than those that are now being grown. However, tests are being conducted in cooperation with the U. S. Southern Great Plains Field Station at Woodward, Okla., the Fort Hays Substation at Hays, Kans., the Nebraska School of Agriculture at Curtis, and the Nebraska Agricultural Experiment Station at its substation at North Platte, with the objective of finding varieties that will set their fruits earlier in the season and also produce fruits of suitable size for market and canning purposes.

A discussion of such varieties as Bonny Best, John Baer, and Marglobe is included in order that other varieties may be compared with them, and to point out their value and limitations for this area.

A description of Johannisfeuer is included because of the possibilities it offers to plant breeders as a source of earliness.

Descriptions for the most part are based on observations made at the Cheyenne Horticultural Field Station, but in those instances where a variety has been tested at other locations and found to differ in important characteristics, comment has been made on the differences noted.

VARIETAL DESCRIPTIONS

BISON

The Bison variety was developed by A. F. Yeager at the North Dakota Agricultural Experiment Station from a cross between Red River and Cooper Special to meet the requirements for a variety that would set its fruits under the hot, dry atmospheric conditions so prevalent in the Great Plains region during July and early August.

The plant is of the determinate or self-pruning habit of growth, compact and comparatively small. It is somewhat sparse in foliage, with the result that under some conditions the fruits may be injured by sunscald. It is exceptionally free-blooming, and, although under some conditions many of its flowers fail to set fruit, it usually produces satisfactory crops.

The fruits are red and of suitable size for home use, but are somewhat smaller than the average market prefers. At the Cheyenne station they average from 2½ to 3 ounces in weight. They are usually smooth, though at times some rough or corrugated fruits may be found on the first cluster. The outer and partition walls average about the same as those of Earliana in thickness and they are of a rich red color.

For localities having climatic conditions similar to those for which Bison was developed, it is a valuable variety, especially for the home gardener. Though not as early as some of the varieties described in this circular, it can be depended upon to produce at least medium yields of ripe fruits even at altitudes of 6,000 feet. Moreover, in lower sections, such as Woodward, Okla., this variety has produced satisfactory yields in years when such varieties as Bonny Best and Marglobe were almost total failures.

BONNY BEST

As grown at the Cheyenne station, Bonny Best is distinctly a mid-season variety. Most strains mature their fruits somewhat later than Earliana, but an early, well-bred strain will mature its fruits as early and frequently earlier than the average strain of Earliana.

During the latter part of August, or whenever conditions are more favorable for fruit setting, Bonny Best is not inferior to many other varieties in its ability to set fruit. However, its frequent failure to produce satisfactory yields is the result of its inability to set its fruits under hot, dry atmospheric conditions so frequently prevalent in the central Great Plains area during the early summer months. At Torrington, Wyo., it has been observed to set fruit on as low as 20 percent of its flowers, and numerous instances are on record of its almost total failure to set fruits.

As grown at this station, the plant may be classified as of medium size with a spread of about 3 feet. The foliage is rather dense, providing adequate cover for the fruits. The fruits average 3 ounces in weight and are usually smooth, firm, and well colored. In some localities the fruits show a tendency to crack radially near the stem end, but they are superior to Marglobe in this respect.

In localities where favorable conditions for fruit setting are the rule, Bonny Best is to be recommended as a satisfactory main-crop variety. However, where hot, drying winds or high temperatures are frequent during July and August, Bonny Best should not be grown, since it is one of the poorest varieties thus far tested with respect to setting its fruits under such conditions.

DANISH EXTRA EARLY

The origin of the Danish Extra Early variety has not been learned, but seed for these tests was obtained from the Heinr Mette Seed Co., of Quedlinburg, Germany. According to this company, Danish Extra Early is the earliest of all varieties grown in Germany, and in tests at this station it has proved to be one of the earliest.

The plant is of medium size and somewhat resembles Bonny Best in general appearance but does not make as large vines. The fruits are exceptionally smooth, globular, and of an even, brilliant-red color. It is extremely prolific, ranking third among the varieties in number of ripe fruits produced in the 1937 tests. Unfortunately

this is not a satisfactory commercial variety because of the small size of its fruits, which average only about 1½ ounces. As a home-garden variety for localities having a short growing season, it seems well worthy of trial. Tests in Nebraska indicate that this variety sets only a small percentage of its flowers under hot, dry atmospheric conditions, and therefore it cannot be recommended for locations where such climatic conditions are of frequent occurence.

DANMARK

Seed of the Danmark variety was obtained from the Grimstad Gartneri Seed Co., of Grimstad, Norway, in 1931. According to this

FIGURE 1.—Single plant of the variety Danmark photographed from below to show prolificacy and distinctive light-green color of immature fruits.

company, this variety was developed and introduced by the J. E. Olsens Enke Seed Co., of Copenhagen, Denmark.

In these tests Danmark has proved to be the earliest variety that produces fruits of sufficient size, smoothness, and quality to be classified as a fairly acceptable commercial variety (fig. 1). Repeated tests have shown that it averages 5 days earlier in maturity than Earliana. Certain other varieties, some of which are described in this circular, have shown themselves to average somewhat earlier than Danmark, but for the most part these are small-fruited types. One variety,

received under the name of "Johannisfeuer," has been found to be earlier than Danmark, and it is what might be classified as a large-fruited type, but its fruits are generally so rough or corrugated as to be unsatisfactory for commercial use (fig. 3, *B*).

In cooperative tests with H. O. Werner, of the Nebraska Agricultural Experiment Station, which were conducted at the North Platte substation, Danmark has demonstrated that it is one of the best in

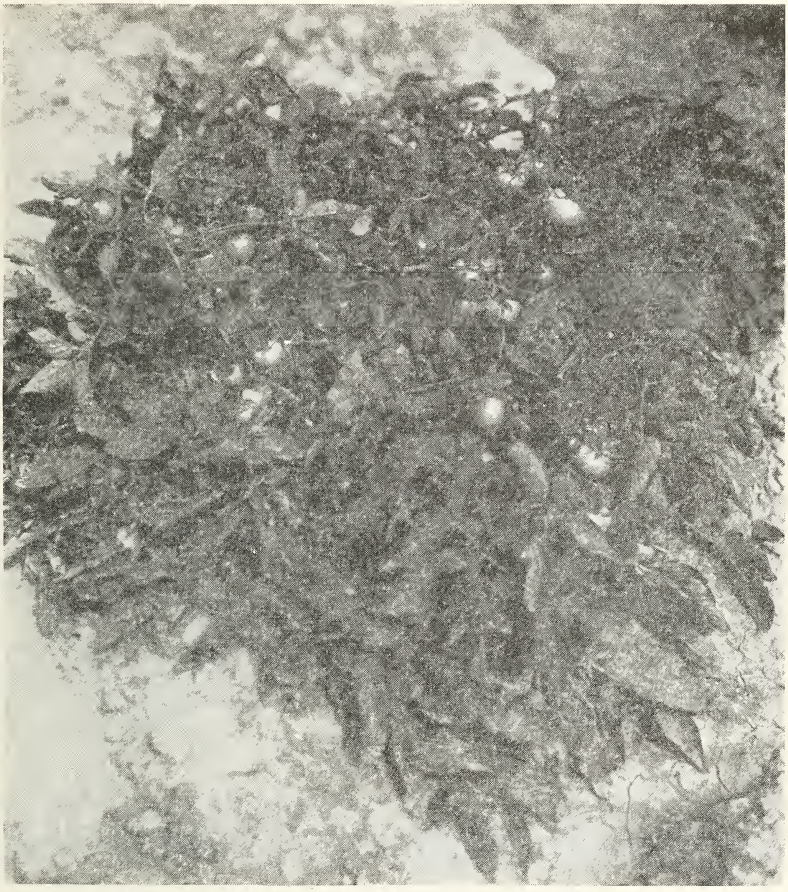

FIGURE 2.—Single plant of the variety Danmark.

its ability to set fruits under adverse climatic conditions. These results were confirmed by L. F. Locke in tests conducted at the U. S. Southern Great Plains Field Station, Woodward, Okla., and by other cooperators in various sections of the central Great Plains area.

In general growth habit Danmark is somewhat similar to Bison in that it is of the determinate or self-pruning type. However, the foliage is much larger and more dense than that of the latter variety and the size and general appearance of the stems (fig. 2) more closely resemble those of Bonny Best. Its fruits are almost perfectly globular in shape, exceptionally smooth, and show very little tendency to

crack or sunscald even under adverse growing conditions (fig. 3). This freedom from cracking and injury from sunscald is probably largely due to the unusually thick skin of the fruit which closely resembles that of Marglobe.

Danmark can be distinguished from most commercial varieties by the peculiar greenish-white color of its immature fruits and the absence of a darker green overcolor at the calyx end. This same color characteristic of the immature fruits is to be found in the variety Allred

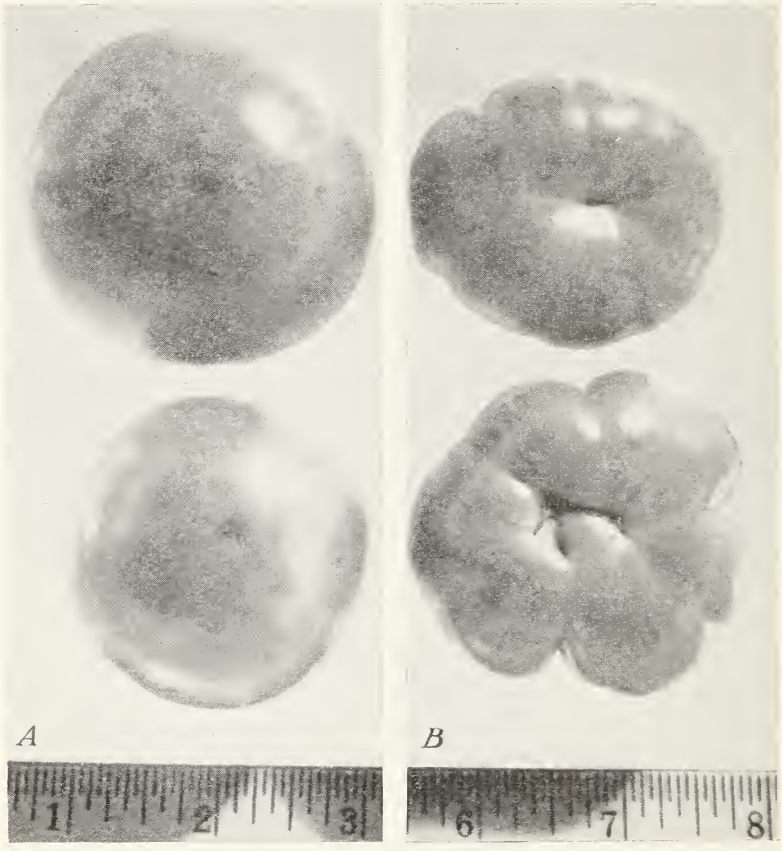

FIGURE 3.—*A*, Typical fruits of the variety Danmark; *B*, typical fruits of the variety Johannisfeuer, showing roughness characteristic of this variety.

and several numbered selections that have been developed by Dr. Yeager; also in Devon Surprise, an English forcing variety.

The mature fruit of Danmark is of a rich, deep-red color and in firmness of flesh it may be compared to Marglobe. It could be highly recommended as a commercial variety if it were not for the somewhat small size of its fruits, which in these tests have been found to average about 2½ ounces as compared to an average of 3½ ounces for Bonny Best, and 3¾ ounces for Earliana. As a home-garden variety, especially in those sections where earliness is an important consideration, Danmark is well worthy of trial.

EARLIANA

In these tests Earliana has lived up to its reputation of being one of the earliest varieties now commonly grown in this country, but it has been found to be definitely later than certain other varieties. Its vine and fruit characteristics as grown at this station do not materially differ from those typical for the variety in other locations, and it is believed that they are so distinct and so familiar that there is little need to describe them here.

Probably one of the major reasons why Earliana does not rank as a first-early variety in this section is its failure to set fruits. In tests at this station where this failure is seldom a serious varietal defect, Earliana has been found to set as low as 40 percent of its flowers; in tests at lower elevations where somewhat more adverse conditions for fruit setting are the rule, it has been observed to set as low as 20 percent of the flowers produced. Since this blossom drop is generally more serious during the early part of the growing season, it delays earliness of maturity and seriously decreases early yields.

Despite its defects, Earliana still remains one of the best of the early varieties and may be recommended as such for localities where the problem of fruit setting is not a serious factor or where the growing season is of sufficient length to mature a satisfactory portion of its fruits.

EARLY PARIS MARKET

Seed of the Early Paris Market variety was secured from M. Hardin, of Geary, Okla., but it is also listed by the Vilmorin-Andrieux Seed Co., of Paris, France, by whom it was introduced.

In its general characteristics this variety is very similar to Earliana, and though it appears to be somewhat later in maturity than the latter it has not differed greatly from it in yield of ripe fruits. Results of tests in various parts of the central Great Plains area indicate that it is affected by environmental conditions to a greater extent than many other varieties. Thus, in the more southerly parts of this region, it is reported as having made highly satisfactory yields, whereas in certain of the more northerly sections it has proved to be decidedly inferior to many other varieties.

ESSEX WONDER

Essex Wonder was secured from the David Bell Seed Co., of Leith, England. According to this company, this variety originated as a single plant selection from the variety Ailsa Craig, and it is said to be more hardy and robust than the latter variety and distinct from it in fruit-cluster type.

Essex Wonder has the general characteristics of the English forcing varieties. In the present tests, however, it has proved to have considerable merit as a garden variety. It is slightly later in maturing than Danmark or Johannisfeuer, but about equal to Earliana. The vine is somewhat larger than that of the latter variety and more open, so that the fruits are subject to sunscald. The fruits are of an attractive red color but average only 1½ ounces in weight. Under some conditions the fruits are soft in texture and do not stand up well after harvesting. Essex Wonder is very prolific, and may prove to be a valuable home-garden variety for sections requiring a prolific first-early tomato.

FARGO YELLOW PEAR

The Fargo Yellow Pear variety was developed and introduced by Mr. Yeager at the North Dakota Agricultural Experiment Station.

The plant is of the determinate type, relatively small but vigorous and prolific. Under average growing conditions it has been found to produce from 75 to 140 fruits per plant. It is fully as early if not slightly earlier in maturity than other strains of Yellow Pear.

Some strains of this variety have been found to be variable as to shape of fruit, but well selected strains are free from this defect and can be highly recommended to those desiring a small-fruited tomato variety of this type.

JOHN BAER

Most seedsmen and other authorities now consider John Baer and Bonny Best to be identical, and some consider Chalk Early Jewel indistinguishable from either of them. However, many growers are still to be found who plant both John Baer and Bonny Best under the impression that they are planting two distinct varieties and are thereby, in a measure, protecting themselves against total loss of a crop through the failure of one variety, or that they are extending the harvest season by the supposed difference between the two varieties in earliness of maturity.

Differences between various strains of these varieties do exist, however, and those desiring to grow them should make certain that they are buying one of the several improved strains now offered by the better seed houses.

JOHANNISFEUER

Seed of Johannisfeuer was secured from the Ernst Benary Seed Co., of Erfurt, Germany, in 1931. It is listed and described here not because of its value for culinary purposes, but because of its extreme earliness and consequent value as a parent in crosses designed to add increased earliness to present-day commercial varieties.

The plant somewhat resembles Earliana in type of growth, but it is even more spreading and open (fig. 4). The fruits are of a flattened-globe shape and are extremely irregular or ribbed (fig. 3, *B*); many of them contain a hard, green, fibrous core usually rendering them unfit

FIGURE 4.—Single plant of the variety Johannisfeuer.

for use. In the mature state they are of a bright-scarlet color and weigh from 2 to 2½ ounces. The skin is comparatively thin and the flesh soft so that they do not stand up well after being harvested.

Repeated tests at this station have shown that Johannisfeuer is the earliest of what may be termed the medium-to-large fruited types thus far tested, and reports from cooperators in various sections of the central Great Plains area confirm these results.

LISTERS PROTECTION

Listers Protection is an English forcing variety, but seed of it may be obtained in this country. With the exception of the Danmark and Johannisfeuer, this variety has proved to be as early as any thus far tried at this station. The plant is of the indeterminate type, vigorous and very prolific. On the basis of number of ripe fruits produced, it has not been excelled by any other variety. The fruits are a rich, dark-crimson color, perfectly globe shaped, very smooth, and exceptionally uniform. Their average weight is approximately 1½ ounces.

Because of the small size of its fruits, this variety cannot be recommended for commercial planting. However, for the home garden where size is not an extremely important characteristic, this variety possesses remarkable possibilities because of its earliness, productivity, and the high quality of its fruits.

MARGLOBE

Marglobe is the result of a cross between Marvel and Globe made in 1917 by the late F. J. Pritchard, of the Bureau of Plant Industry. It is very vigorous and develops a large plant with large, dark-green leaves which provide a dense cover for the fruits. The fruits average about 3½ ounces in weight, and are globular in shape, very firm of flesh, and ripen to an even, dark-red color. A common and serious fault of Marglobe is that the fruits are frequently rendered unfit for sale by the presence of deep, radial cracks near the stem end.

Marglobe should be considered a late variety for most of the area under consideration, and in those places where climatic conditions are similar to those of Cheyenne or at higher elevations it cannot be expected to mature more than a small percentage of its fruits.

Many instances are on record of Marglobe either totally failing to set fruit or setting so few fruits as to cause a crop failure. Reports of its failure to set fruit have come from the winter-garden region of Texas. Occasionally highly satisfactory yields are reported, but these are usually made under climatic and cultural conditions better than the average that obtains in this area.

Because of its lateness, Marglobe is unsuited to the higher, cooler altitudes found in this region. At lower altitudes, because of its unreliability as regards fruit setting, it should not be planted as a main-crop variety until tests have been made to determine its suitability for the location where it is to be grown.

MILLETS DAKOTA

The Millets Dakota variety is said to have originated as a single plant selection made by John W. Millet, of Bismarck, N. Dak. It closely resembles Chalk Early Jewel in plant type. Trials at this

station have proved it to be about as early as Earliana in maturity and to have equaled the latter variety in yields of ripe fruits. Moreover, very satisfactory yields have been made by it at lower elevations in both the northerly and more southerly sections of this area. It is claimed that this variety is more prolific than most other sorts under unfavorable growing conditions. Results of trials under dry-land conditions at the United States Dry Land Field Station, Sheridan, Wyo., show that it maintained its fruit size better than most varieties under conditions of extreme drought.

The fruits as grown at Cheyenne range in weight from 2½ to 3¾ ounces. When mature they are of a rich, deep-scarlet color, generally fairly smooth, and of good quality.

Because of the desirable size of its fruits and its satisfactory yields under unfavorable growing conditions, it is believed that this variety is worthy of trial by both home gardeners and commercial growers.

PENN STATE

The Penn State variety was developed by C. E. Meyers, of the Pennsylvania Agricultural Experiment Station, from a cross between Penn State Earliana and Cooper Special.

Penn State is a relatively new variety and has not yet been sufficiently tested either at this station or throughout this area to warrant definite conclusions concerning its value. Preliminary tests, however, indicate that it is considerably later in maturity than Earliana or the earlier strains of Bonny Best. Cooperative tests conducted with H. O. Werner at the North Platte substation in 1937 indicate that Penn State produces much lighter yields than Earliana, and it was found to have the highest percentage of culls of the 16 varieties under test there. The chief defect contributing to the high percentage of culls was the numerous small, circular cracks that covered practically all of the exposed surface of the fruits, giving a rough, corky texture to the skin. This defect was not so noticeable in locations having a higher altitude, but even there it appeared during the latter part of the growing season.

The plant is of the determinate or self-pruning type and consequently smaller than that of such varieties as Earliana or Bonny Best. The leaves are medium green, relatively large, but not sufficiently dense to provide adequate coverage for the fruit. The fruits are usually described as being globular, but those of the strain used in these trials were a somewhat elongated globe in shape, medium to light green in color with a darker green overcolor about the calyx end. When mature they are bright scarlet and average about 4½ ounces in weight.

Since the results of these preliminary tests on the whole are rather unfavorable, it is recommended that growers in the central Great Plains area be cautious about planting this as a main-crop variety without first testing it for themselves.

RED RIVER

The Red River variety was developed by a Mr. Yeager at the North Dakota Agricultural Experiment Station from a cross between North Dakota Earliana and Sunrise.

In trials at the Cheyenne station, Red River appears to be very similar to Earliana in plant and fruit characteristics. It is equal to

but has not exceeded the latter variety in earliness of maturity. The mature fruits are bright scarlet, usually weigh between 4 and 5 ounces as grown at this station, and on the average are somewhat smoother than those of Earliana. They are slightly flattened globe shape.

The results of tests in this area conducted at elevations lower than that of Cheyenne indicate that this variety may be expected to produce about the same yields as Bonny Best, but less than such varieties as Bison, Earliana, and Danmark. It appears, therefore, that growers would do well to grow one of the latter named varieties in preference to Red River.

SAN MARZANO

San Marzano is a small-fruited variety that is relatively popular in Europe, especially in Italy. By some authorities it is considered an improved type of the variety King Humbert. In this country it is chiefly grown in California where thousands of acres are planted each year for making tomato paste or for canning whole.

As grown at this station, the plants are of medium size, upright in growth, and have rather finely divided, deep-green foliage. The fruits are borne in clusters of from 8 to 12 and the plants are very prolific. The fruits are oval or plum shaped, slightly larger toward the blossom ends, and slightly furrowed on their broader sides. When mature they are a deep-scarlet red, are exceptionally firm fleshed, and have a rather thick, waxy skin. Their weight ranges from 1 to 1¼ ounces, but larger fruited strains are now available in this country. A serious defect of this variety is its susceptibility to blossom-end rot which it shows even under favorable growing conditions. It does not differ greatly in earliness of maturity from Yellow Pear or similar varieties.

As indicated from its description, this variety is of interest only to those desiring an exceptionally firm-fleshed, high-quality tomato for use in making tomato conserves or for canning whole.

SCARLET DAWN

Tests of Scarlet Dawn have not been conducted over a sufficiently long period nor wide range of territory to permit definite conclusions as to its value for this area. However, preliminary results indicate that it is too late in maturing for those sections having an altitude as high or higher than that of Cheyenne. Trials at lower altitudes indicate that it may be slightly later in maturity than Bonny Best and about equal to the latter variety in yield. The fruits are scarlet red when mature, globular, smooth, firm fleshed, and weigh from 5½ to 6 ounces.

SPEED

For all practical purposes Speed may well be described as an early, small-fruited strain of Earliana, which closely resembles Avon Early, a strain of Earliana introduced to the trade in 1921.

Tests at this station have shown that it is one of the earliest varieties thus far tried and that it is very prolific. At lower elevations it has produced fairly satisfactory yields, but since the fruit is considerably smaller than other varieties that can be grown, it cannot be recommended for such locations. The average weight of the fruits as grown at this station is about 2¾ ounces, but there is some evidence that at lower elevations their size is somewhat reduced.

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